THAT WHICH IS CLAIMED IS:

1. An article having a nonfouling surface thereon, said article comprising:

(a) a substrate having a surface portion;

(b) a linking layer on said surface portion; and

(c) a polymer layer formed on said linking layer by the process of surface-initiated polymerization of monomeric units thereon, with each of said monomeric units comprising a monomer core group having at least one protein-resistant head group coupled thereto, to thereby form a brush molecule on said surface portion;

said brush molecule comprising a stem formed from the polymerization of said monomer core groups, and a plurality of branches formed from said hydrophilic head group projecting from said stem.

2. The article of claim 1, wherein said surface portion comprises a material selected from the group consisting of metals, metal oxides, semiconductors, polymers, silicon, silicon oxide, and composites thereof.

3. The article of claim 1, wherein said surface portion comprises gold.

4. The article of claim 1, wherein said linking layer is continuous.

5. The article of claim 1, wherein said linking layer is patterned.

6. The article of claim 1, wherein said linking layer is a self-assembled monolayer.

7. The article of claim 1, wherein said linking layer comprises an initiator-terminated alkanethiol.

8. The article of claim 1, wherein said surface-initiated polymerization is carried out by atom transfer radical polymerization.

9. The article of claim 1, wherein said surface-initiated polymerization is carried out by free radical polymerization.

10. The article of claim 1, wherein said monomer is a vinyl monomer.

11. The article of claim 1, wherein said vinyl monomer is selected from the group consisting of styrenes, acrylonitriles, acetates, acrylates, methacrylates, acrylamides, methacrylamides, vinyl alcohols, vinyl acids, and combinations thereof.

12. The article of claim 1, wherein said protein resistant head group comprises a hydrophilic head group.

13. The article of claim 1, wherein said protein resistant head group comprises a kosmotrope.

14. The article of claim 1, wherein said protein resistant head group is selected from the group consisting of oligosaccharides, tri(propyl sulfoxide), phosphorylcholine, tri(sarcosine) (Sarc), N-acetylpiperazine, permethylated sorbitol, hexamethylphosphoramide, an intramolecular zwitterion, and mannitol.

15. The article of claim 1, wherein said protein resistant head group comprises poly(ethylene glycol).

16. The article of claim 1, wherein said brush molecule is from 5 to 50 nanometers in length.

17. The article of claim 1, said brush molecule formed on said surface portion at a density from 40 to 100 milligrams per meter^2.

18. The article of claim 1, further comprising a protein, peptide, oligonucleotide or peptide nucleic acid covalently coupled to said brush molecule,

said protein, peptide, oligonucleotide or peptide nucleic acid consisting essentially of a single preselected molecule.

19. The article of claim 18, wherein said preselected molecule is a receptor.

20. The article of claim 1, wherein said article is a contact lens or intra-ocular lens.

21. The article of claim 1, wherein said article is an orthopedic implant.

22. The article of claim 1, wherein said article is a vascular graft or a stent.

23. The article of claim 1, wherein said article is a shunt or catheter.

24. The article of claim 1, wherein said article is a dialysis machine or blood oxygenator and said surface is a blood contact surface.

25. The article of claim 1, wherein said article is an implantable electrical lead, an implantable electrode, an implantable pacemaker, or an implantable cardioverter.

26. The article of claim 1, wherein said article is a label-free optical or mass detector and said surface is a sensing surface.

27. The article of claim 1, wherein said article is a biosensor or assay plate.

28. A method of using an article of claim 1, comprising:

(a) providing an article of claim 1; and then

(b) contacting said article to a biological fluid, and where proteins in said fluid do not bind to said surface portion.

29. The method of claim 28, wherein said contacting step is carried out *in vivo* or *ex vivo*.

30. The method of claim 28, wherein said biological fluid consists essentially of blood, blood plasma, peritoneal fluid, cerebrospinal fluid, tear, mucus, or lymph fluid.

31. The method of claim 28, wherein said contacting step is carried out for a time period of at least one day.

32. A method of using an article of claim 1, comprising:

(a) providing an article of claim 1, said article further comprising a first member of a specific binding pair covalently coupled to said brush molecule, said first member consisting essentially of a single preselected molecule; and then

(b) contacting said article to a biological fluid, said biological fluid containing a second member of said specific binding pair, wherein said second member of said specific binding pair binds to said surface portions, and where other proteins or peptides in said fluid do not bind to said surface portion.

33. A method of making an article having a nonfouling surface thereon, said method comprising:

(a) providing a substrate having a surface portion;

(b) depositing a linking layer on said surface portion; and

(c) forming a polymer layer on said linking layer by the process of surface-initiated polymerization of monomeric units thereon, with each of said monomeric units comprising a monomer core group having at least one protein-resistant head group coupled thereto, to thereby form a brush molecule on said surface portion;

said brush molecule comprising a stem formed from the polymerization of said monomer core groups, and a plurality of branches formed from said hydrophilic head group projecting from said stem.

34. The method of claim 33, wherein said surface portion comprises a material selected from the group consisting of metals, metal oxides, semiconductors, polymers, silicon, silicon oxide, and composites thereof.

35. The method of claim 33, wherein said surface portion comprises gold.

36. The method of claim 33, wherein said linking layer is continuous.

37. The method of claim 33, wherein said linking layer is patterned.

38. The method of claim 33, wherein said linking layer is a self-assembled monolayer.

39. The method of claim 33, wherein said linking layer comprises an initiator-terminated alkanethiol.

40. The method of claim 33, wherein said surface-initiated polymerization is carried out by atom transfer radical polymerization.

41. The method of claim 33, wherein said surface-initiated polymerization is carried out by free radical polymerization.

42. The method of claim 33, wherein said monomer is a vinyl monomer.

43. The method of claim 42, wherein said vinyl monomer is selected from the group consisting of styrenes, acrylonitriles, acetates, acrylates, methacrylates, acrylamides, methacrylamides, vinyl alcohols, vinyl acids, and combinations thereof.

44. The method of claim 33, wherein said protein resistant head group comprises a hydrophilic head group.

45. The method of claim 33, wherein said protein resistant head group comprises a kosmotrope.

46. The method of claim 33, wherein said protein resistant head group is selected from the group consisting of oligosaccharides, tri(propyl sulfoxide), phosphorylcholine, tri(sarcosine) (Sarc), N-acetylpiperazine, permethylated sorbitol, hexamethylphosphoramide, an intramolecular zwitterion, and mannitol.

47. The method of claim 33, wherein said protein resistant head group comprises poly(ethylene glycol).

48. The method of claim 33, wherein said brush molecule is from 5 to 50 nanometers in length.

49. The method of claim 33, said brush molecule formed on said surface portion at a density from 40 to 100 milligrams per meter^2.

50. The method of claim 33, further comprising the step of covalently coupling a protein, peptide, oligonucleotide or peptide nucleic acid to said brush molecule, said protein, peptide, oligonucleotide or peptide nucleic acid consisting essentially of a single preselected molecule.